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*Description of an Ancient Anomalous  
Skeleton from the Valley of Mexico;  
with Special Reference to Supernume-  
rary and Bicipital Ribs in Man.*

*presented*  
By DR. ALEŠ HRDLIČKA.

AUTHOR'S EDITION, extracted from BULLETIN

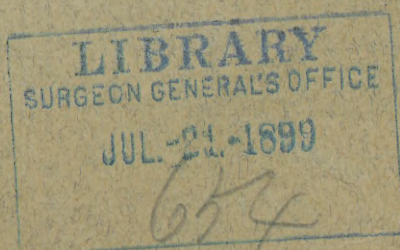
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*With Compliments of A Hudlicka,*

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**Article V. — DESCRIPTION OF AN ANCIENT ANOMALOUS SKELETON FROM THE VALLEY OF MEXICO; WITH SPECIAL REFERENCE TO SUPERNUMERARY AND BICIPITAL RIBS IN MAN.<sup>1</sup>**

By DR. ALEŠ HRDLIČKA.

The skeleton described in this paper was exhumed at the adobe-works at St. Simon Tonaguac, a small suburb of the City of Mexico. The same place has yielded from time to time human bones and various objects of archæological interest. The bones were procured directly from the workmen by Dr. Carl Lumholtz during his explorations for the American Museum of Natural History, and are now in the Anthropological Department of the Museum (Catalogue No.  $\frac{99}{252}$ ).

The skeleton was discovered about three metres below the surface. The workmen were unable to give definite information regarding the surroundings of the bones. The importance of the skeleton induced me to make, on my recent visit to Mexico,<sup>2</sup> a special examination of the adobe-works about St. Simon.

St. Simon lies about a mile and a half northeast from the City of Mexico, to the left of the road which leads to Guadalupe. Most of the inhabitants of this little town, as well as those of several small settlements adjoining, are occupied with adobe-making. The grounds of St. Simon are part of the lowlands which extend from the City of Mexico to the Lake of Texcoco. In places the ground rises slightly over the level of the lowlands, and here most of the excavating is done.

The adobe deposit consists of a rather compact dark gray earth. Originally it was probably marsh land, which has been covered with material derived from successive inundations. Mixed with this is the accumulated refuse from habitations, which contains many fragments of pottery, pieces of obsidian, and bones of animals.

The particular place from which the skeleton came is at a rise

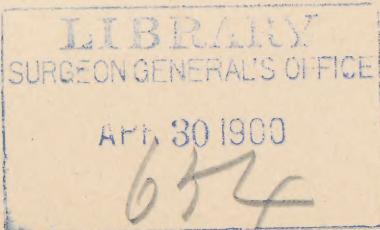
<sup>1</sup> Read in a preliminary form before the American Association for the Advancement of Science, August 13, 1897.

<sup>2</sup> Lumholtz-Hrdlička Expedition, under the auspices of the American Museum of Natural History, New York, March-July, 1898.

[May, 1899.]

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of about two metres above the level land, and is about seventy metres in its greatest length. Its characteristics are identical with those of the other adobe-works of St. Simon. I could distinguish no regular stratification in the earth of this place, nor any difference in its composition at different heights. The deeper parts look darker and even black ; but this is due to difference in moisture. About four metres below the highest point of the surface, water is met toward the end of the dry season. This prevents further digging downward.

Throughout the deposit, but particularly in its upper third, numerous layers of fragments of pottery are found. These layers do not form continuous strata, and when exposed from the top look like larger or smaller irregular heaps of fragments. In all probability they represent dumps of refuse. Down to two metres and a half from the top, I found individual animal bones in these layers of potsherds, or in the earth between them. Below this the deposit is less productive of remains of all kinds, and the fragments of pottery are much more scattered. At a depth of three metres and below, numerous human skeletons are met with, and occasionally stone beads, terracotta, and stone figures are found. The skeletons lie singly. The archaeological objects belong apparently to the Aztec culture.

The anomalous skeleton comes from this lower portion. During my stay in the City of Mexico, I obtained about fifteen additional skulls and skeletons from the same place and depth. Among these skulls or skeletons, so far as I can say from a preliminary examination, there is not one that approaches in inferior characteristics the specimen here described.

I gave a certain amount of attention to the fragments of pottery found at different horizons in the adobe deposits of St. Simon. My observations, which are not those of a trained archaeologist, may be summed up as follows. In no portion of the deposit, to the depth of four metres, do fragments of any one kind of pottery predominate to the complete exclusion of other kinds. Many of the fragments found, from the surface down to a depth of 1.5 metres, are of very smooth, polished ware of a bright red color. Numerous other fragments from this same part show various drawings in colors, and still other fragments have stamped or incised designs. At the same time, there are frequently found,



among these fragments of high-grade pottery, pieces of very rude earthen vessels, thick, rough, and without any decoration whatever; also crude potsherds showing impression of network with which they were surrounded. Lower down, the higher grades of fragments become rare and the crude fragments more frequent. I myself dug out, however, a fragment of the red, highly polished pottery from over two metres below the surface; and at a depth of from three to four metres I took out half of a fine Aztec tumbler, and saw an entire one dug from the same layer. These, however, may have been buried there.

Obsidian fragments are met with throughout the whole deposit. They consist generally of crude fragments or pieces; but occasionally parts of knives or chisels, or nuclei, are also found. Among the hundreds of obsidian fragments which I examined, I did not find an arrow or a spear point; nor have the brickmakers whom I questioned on this point met with any.<sup>1</sup> From my observations on this particular adobe-field, I reach the following conclusions:—

The field is an old, gradual accumulation of aqueous origin, augmented by irregular heaps of refuse consisting mainly of fragments of pottery. The upper half, or a little more, of the deposit, corresponds to the period in which the best kind of Aztec pottery was made. The lower parts show a predominance of crude forms of earthenware, some of which may be of a pre-Aztec origin.

About three metres from the surface of the mound begins what in all probability is a prehistoric burial-place. Judging from the pottery, figures, and ornaments buried here, and from the nature of the majority of the skulls recovered, this burial-place has been at least partly utilized by the Aztecs.

The skeleton here described, as already stated, lay deep in the ground. It could not be ascertained if any ancient manufactured objects were found in its immediate vicinity. Other skulls from the same locality were secured at the same time by Dr. Lumboltz. About half of these agree in appearance, to a certain extent, with the skull of the skeleton in question; while the other portion differs. Several of this latter class show signs of incineration.

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<sup>1</sup> Some of the important adobe-fields around the City of Mexico have received the attention of Professor William H. Holmes of the National Museum in Washington. His two notes on these deposits are published in the Transactions of the Anthropological Society of Washington, 1885, pp. 69, 70, and in Ancient Cities of Mexico, 1897, p. 299.

Most of the skulls I obtained from the same locality also agree in appearance, to a certain extent, with the skull of this skeleton. But, as already mentioned, there is not one among the skulls or skeletons from this locality, and now in the possession of the Museum, which approaches this specimen in inferior characteristics. All the parts of the skeleton, and most of the other bones from the same place, are fairly well preserved. The bones contain but little organic matter.

The skeleton is not complete. Three of the vertebræ (sixth cervical, last dorsal, and first lumbar), both ulnæ, several teeth, and most of the small bones of the hands and feet, are missing. Not one of the parts present shows any pathological changes.

The general characteristics of the bones of the specimen, taken together, indicate that we have to deal with the skeleton of an adult though not very aged man of moderate muscular development and of rather small stature.

The skull is of small size, and somewhat deformed. The deformity is of the kind which Topinard terms 'simple occipital.' It consists, in this case, of a flattening, slightly greater on the right, of that part of the occiput which is situated between the external occipital protuberance or inion, and the parietal foramina or obelion. The same deformation may be seen in a few other male skulls from the same locality. I have also occasionally found the same type among skulls of prehistoric peoples of other parts of Mexico. It is the type of deformation of the old mound-builders, pueblos, and cliff-dwellers, but not carried to the extreme. Waitz mentions,<sup>1</sup> that, in many of the Indian tribes, the flat-backed heads were produced artificially by means of a special form of the infant's cradle, or of what served in place of it.

In size the skull does not reach that of an average male adult of the white race. The thickness of its parietal bones below the parietal bosses ranges from 3.5 mm. to 4.5 mm.,—a proportion common in the whites.<sup>2</sup>

The forehead is well arched, and fairly high and broad, having a minimum frontal diameter of 9 cm. Its aspect, however, has been affected by the occipital compression. The sagittal region

<sup>1</sup> *Anthropologie der Natur-Völker*, IV, p. 62.

<sup>2</sup> The subject, calculating his height from the long bones by Manouvrière's Tables, measured about 1.6 metres.



is high, oval from side to side, and presents no marked ridges or depressions. The parietals are full, and the right side shorter than the left. The temporal regions are about as concave as in an ordinary white mesocephalic skull. The temporal ridge is from 5 mm. to 8 mm. broad, and well marked; approach of its upper edge to the bregma, along the coronal suture, is 7.1 cm.; the closest approach of its upper edge to the sagittal suture is about 4.5 cm. Both these distances are smaller than in the average white.<sup>1</sup> The occipital region is compressed. The occipital ridges and depressions are rather feeble, the crest being low and not very distinct. The mastoids are strong and of a good size, though not excessive. The supramastoid elevations are about medium.

Of the facial parts the supra-orbital ridges are about as large as those in an average adult male white, or perhaps slightly larger. The glabella is convex and full. The malars are prominent, but not of excessive strength or size. They show no trace of any division. The zygomæ are moderately massive, the maximum bizygomatic diameter being 12.8 cm. This is low in comparison with measurements of Mexican Indians from other localities. The canine fossæ are of medium depth. The nasal-root depression is small; the nasal bridge, low and concave; and the nasal bones, narrow. The nasal aperture is pyriform, and not very large. The nasal spine is quite strong and of medium height, being .9 cm. long. The nasal notches are well defined, the left slightly lower. There are no *gouttières simiennes* (subnasal depressions). On both sides of the face the lachrymal bone enters into the formation of the lower border of the orbit; on the right side it descends externally more than 2 mm. below it. A suture runs from each of the infra-orbital foramina to the edge of the orbit, and along the floor of this to the posterior opening of the infra-orbital canal.

The dental arches are strong, though not massive. The upper arch is somewhat irregular externally and on the right. This irregularity consists of a greater depression over the incisors, and a somewhat greater elevation over and behind the canine, and is due to a vicious disposition of the dental sockets, to which I shall

<sup>1</sup> In a series of examinations of the skulls of whites, I found the distance of the upper border of the temporal ridges to range from 5 cm. to 7 cm., with an average of about 6.3 cm.

refer later. There is a certain amount of prognathism of the upper dental arch, but the face as a whole is orthognathous. (Plate I.) The lower jaw is of a peculiar shape, and is shown in Plate II, Fig. 1. I have found no other under-jaw of this type among the Mexicans. The bone is not very heavy, and is rather short. The angles are somewhat divergent, quite prominent, and externally irregular, which will be better seen in the front view

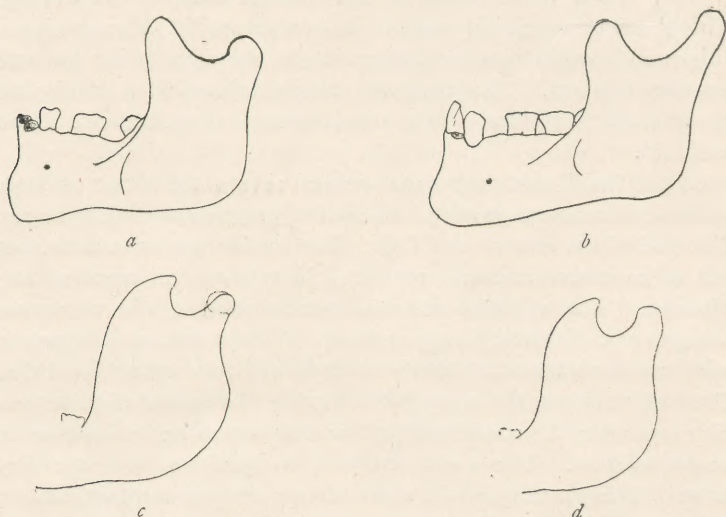


Fig. 1. Lateral Views of Lower Jaws: *a*, From Valley of Mexico ( $\frac{99}{258}$ ); *b*, Normal Male from Valley of Mexico ( $\frac{99}{258}$ ); *c*, Male Gorilla (Coll. Phys. and Surg.); *d*, Female Gorilla (Coll. Phys. and Surg.).

(Plate I). The chin is of medium prominence. The vertical ramus is relatively broad. But the most remarkable characteristics of this jaw are the form and relation of its processes and the form of the sigmoid arch they enclose. The coronoid process is distinctly higher than the condyloid, although our subject is not an aged person. The condyloid process is very short, which is more apparent on the specimen itself than on the figure; and the sigmoid notch is much more open toward the front than toward the back. These characteristics of the upper extremity of the vertical ramus of the lower jaw are much more like those found in the Apes, particularly in the Gorilla, than in the human species. Fig. 1 is a stereographic drawing of this jaw, of two



jaws of adult Gorilla (reduced), and also of a normal jaw from the Valley of Mexico.

The external auditory meati are small, measuring 4 by 7 mm. The retromastoid vascular foramina are large. This characteristic, combined with unusual smallness, or even absence, of the parietal vascular foramina, is almost constant in other skulls from the same location, while series of skulls from other parts of Mexico show this phenomenon only exceptionally.<sup>1</sup> The base of the cranium is somewhat asymmetrical, which is the regular feature of skulls with occipital deformation. The bony processes of the base are of moderate strength. The left styloid is 2.7 cm. in length. The great wing of the left pterygoid process sends a slender, bony prolongation backward, which is almost met by a spicula of bone from the spinous process of the sphenoid bone; the two forming a slightly incomplete pterygospinous foramen. Various degrees of this anomaly are found in the majority of skulls from the same locality, although it is exceptional in other parts of Mexico. (A tendency to the formation of pterygospinous foramina is frequent in the whites.)

The various nervous and vascular openings of the base show nothing special in size or disposition. The anterior lacerated foramen is smaller than in whites. The foramen magnum is somewhat irregularly ovoid in shape, the anterior part being the narrower. It measures 3.2 cm. in length by 2.9 cm. in breadth, with an index of 90.6. The posterior nares are well formed, and not more oblique than in whites. They are smaller in length than in breadth, their index reaching 105.9. This high index of the posterior nares is another characteristic of skulls from St. Simon Tonaguac. The petrous parts are slightly depressed below the level of the base. The glenoid fossæ are of fair depth. The palate is slightly parabolical in outline, and normal. The dental arches are strong, without being too massive.

Dentition has been completed. Most of the teeth are lost, apparently since death, as the alveoli show no signs of obliteration or absorption. The remaining teeth are of medium size, and normal in shape, but are set somewhat irregularly. The left upper and both lower wisdom teeth point almost directly forward,

<sup>1</sup> The inverse relation between the size of the retromastoid and the parietal vascular foramina is not uncommon.

and somewhat inward; and on the right side of the upper alveolar process in front, we find a diastema between the first incisors; while the first bicuspid is situated over and a little behind the neighboring canine.

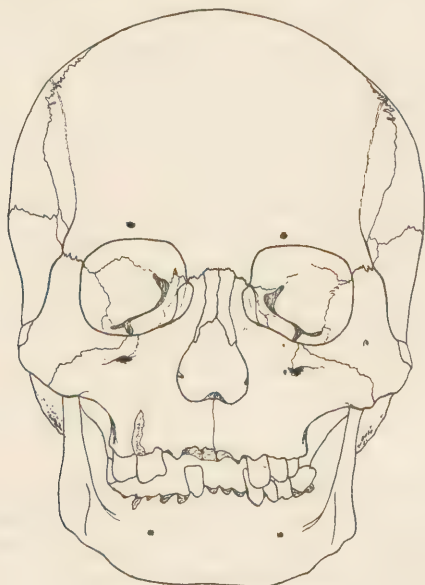


Fig. 2. Norma Anterior ( $\frac{20}{22}$ ).

In the interior of the skull, as far as this could be examined, there was found nothing special. The frontal crest is low.<sup>1</sup> By Broca's method, the capacity of the skull is 1270 cm.; by Flower's, 1225 cm. This is the lowest of the capacities of the male skulls from St. Simon. (Figs. 2-6.)

#### MEASUREMENTS OF SKULL.<sup>2</sup>

##### CRANIUM

Maximum antero-posterior diameter.....	15.6 cm
Maximum transverse diameter.....	14.0 cm
Cephalic index <sup>3</sup> .....	89.7
Height (basion-bregma).....	12.9 cm

<sup>1</sup> The sharp crest situated in the median line on the ventral surface of the frontal bone differs, both in extent and height, in different individuals. In its extremes it may possibly prove a racial characteristic, though never one of prime value.

<sup>2</sup> The French methods and nomenclature are followed throughout, unless otherwise indicated.

<sup>3</sup> These indices are of secondary value on account of the occipital deformation. The mean cephalic index of six male skulls from the same locality, with similar deformation, was 89.0; of three male skulls, without deformation, 80.0; of five female skulls, without deformation, 81.4.



Height-length index.....	82.7	
Height-breadth index.....	92.1	
Minimum frontal diameter.....	9.0	cm
Bistephanic diameter.....	11.0	cm
Bi-auricular diameter (between points where temporal depression begins, above the roots of zygomæ).....	11.2	cm
Bimastoid diameter (between tips of mastoids).....	9.8	cm
Basion-alveolar point.....	8.9	cm
Basion-nasion.....	8.8	cm
Basion-bregma.....	12.9	cm
Basion-obelion.....	10.8	cm
Basion-lambda.....	9.75	cm
Basion-inion.....	7.4	cm
<b>ARCS</b>		
Maximum circumference above the supra-orbital ridges.....	47.9	cm
Centres of external meati auditorii over forehead, above the ridges.....	28.0	cm
Centres of external meati auditorii over frontal eminences.....	30.0	cm
Centres of external meati auditorii over bregma.....	32.5	cm
Centres of external meati auditorii over maximum expanse of the cranial vault.....	33.3	cm
Centres of external meati auditorii over lambda.....	26.6	cm
Centres of external meati auditorii over inion.....	22.0	cm
Nasion-bregma.....	11.7	cm
Nasion-inion.....	28.3	cm
Nasion-opisthion.....	32.5	cm
Nasion-ophryon (Topinard).....	2.0	cm
<b>FACE</b>		
Chin-nasion diameter.....	10.9	cm
Alveolar point-nasion diameter.....	6.55	cm
Bijugal diameter.....	11.5	cm
Maximum bizygomatic diameter.....	12.8	cm
Facial index, $\frac{\text{alveolar point ophryon height} \times 100}{\text{maximum bizygomatic diameter}}$ .....	66.8	
Maximum diameter (exterior) of upper dental arch.....	6.5	cm
Bimandibular diameter (between elevations marking the union of posterior with anterior ramus).....	8.1	cm
Bigonial diameter.....	10.1	cm
Height (nose).....	4.45	cm
Maximum width (nose).....	2.4	cm
Nasal index <sup>1</sup> (platyrrhine).....	53.9	
Height (orbits).....	3.35	cm
Width " (inner edge of lachrymal canal at dacryon point to maximum outer point).....	3.70	cm
Orbital index <sup>2</sup> (megasème).....	90.5	

<sup>1</sup> Average of nine male skulls from same locality, 50.4; of five females, 53.0.<sup>2</sup> Average of nine male skulls from same locality, 90.6; of five females, 91.5.

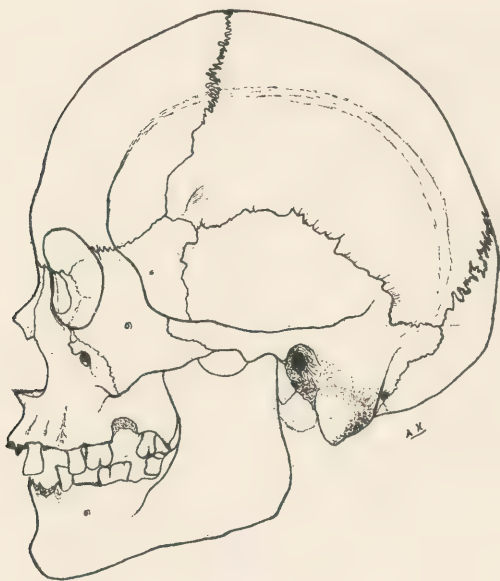


Fig. 3. Norma Lateralis ( $\frac{289}{289}$ ).

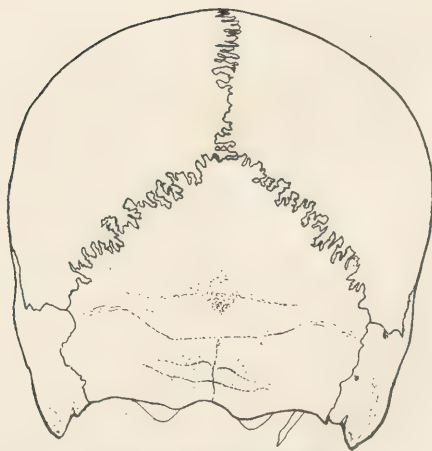


Fig. 4. Norma Posterior ( $\frac{289}{289}$ ).



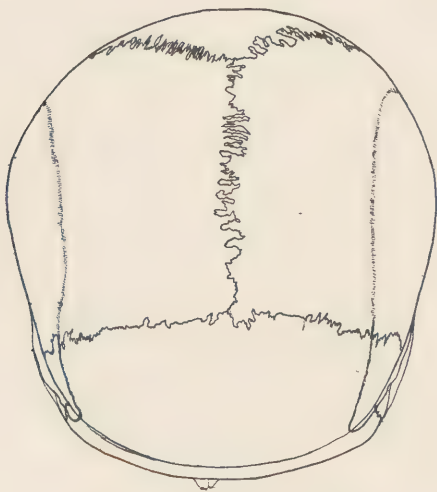


Fig. 5. Norma Superior ( $\frac{99}{282}$ ).

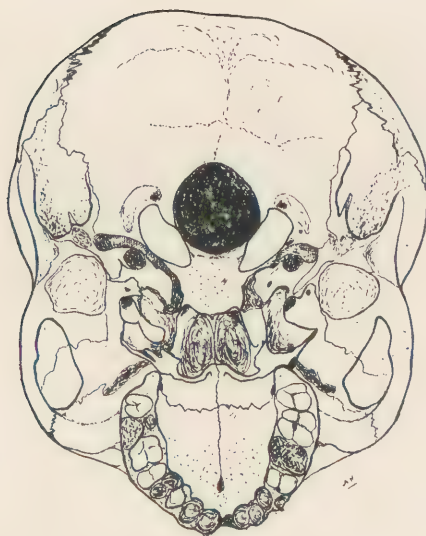


Fig. 6. Norma Inferior ( $\frac{99}{282}$ ).

Height (upper dental arch) from alveolar point to nasal point....	2.0 cm
Lower jaw (mentum to lower alveolar point).....	3.4 cm
Height of posterior ramus of lower jaw (coronoid process, 6.5 cm.; condyloid process, 6.0 cm.).....	6.25 cm
Length of anterior ramus of lower jaw.....	9.6 cm
Depth of sigmoid notch of lower jaw.....	1.63 cm
Angle.....	116°
Thickness of lower jaw at symphysis.....	1.2 cm
Thickness of lower jaw at second molars.....	1.7 cm

## BONES OF THE BODY.

## VERTEBRAL COLUMN.

	<i>Cervical Vertebrae.</i>	<i>Dorsal Vertebrae.</i>	<i>Lumbar Vertebrae.</i>
Present.....	6 (6th wanting)	11 (12th wanting)	4 (1st wanting)
Conformation.....	normal	normal	normal
Spinous processes...	bicuspid to 5th	resemble lumbar from 10th	bodies broad except 5th, which is of moderate breadth
Maximum antero- posterior diameter at middle.....	of 3d, 3.90 cm	of 6th, 5.10 cm	of 5th, 6.90 cm
Antero-posterior di- ameter of body....	" 1.40 cm	" 2.45 cm	" 2.90 cm
Maximum lateral di- ameter.....	" 4.50 cm	" 5.40 cm	" 9.20 cm
Maximum lateral di- ameter of body....	" 1.75 cm	" 2.45 cm	" 4.50 cm
Antero-posterior di- ameter of canal....	" 1.40 cm	" 1.55 cm	" 1.35 cm
Maximum lateral di- ameter of canal....	" 1.85 cm	" 1.45 cm	" 1.90 cm
Height (body).....	" 1.10 cm	" 1.85 cm	" 2.75 cm
Length of spinous process (from notch)	" 1.75 cm	" 4.30 cm	{ " 3.15 cm " 4.20 cm

The bones are of rather sub-medium size and strength for a male, and differ in no important characteristic from the vertebrae of whites.

## SACRUM.

This is composed of six segments;<sup>1</sup> but the sixth segment is somewhat rudimentary. The first body is only partly united to the rest of the bone. The lowest (fifth) pair of foramina is incomplete in the back. The inner curve of the bone is rather small, and commences below the third segment.

<sup>1</sup> The only two other sacra from the same locality, and now in this Museum, are each composed of six segments.



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Maximum length of sacrum .....	12.6 cm
Maximum breadth of sacrum .....	11.0 cm
Index of entire bone <sup>1</sup> .....	87.2
Index of bone, excluding sixth segment .....	99.1

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## THORAX.

The constituents of the thorax of this skeleton are very remarkable. There are 26 ribs present, instead of 24, the usual number. By careful and repeated examinations, the characteristics of these ribs have been found entirely homogeneous, so that it is impossible to eliminate any pair as extraneous. Of these ribs 13 are right, and 13 left. They agree in color, form, and size. The skeleton, so far as we know, was found isolated, was kept together, and in the Museum it has since been kept separate. No question as to the identity of all the ribs with the skeleton has been raised by any one of the numerous scientists who have examined it.

We have here a pair of supernumerary ribs. The question is, Which of the thirteen pairs is the supernumerary one? Examination of the ribs alone does not satisfy us on this point. There are two pairs of floating ribs, as usual; and none of the remaining pairs can be distinguished from the regular ribs. On examining the vertebræ, however, we find an articular facet on each side of the seventh cervical; and a reconstruction of the upper part of the thorax demonstrates that the ribs begin at this vertebra, not at the first dorsal. There is no rudimentary or floating cervical rib. The first pair of ribs, although presenting an anomaly on one side, which will be described later on, has otherwise all the characteristics of the regular first dorsal ribs; and in the same way all the following pairs of ribs resemble the corresponding regular pairs of the normal thorax. Granted that the two uppermost ribs are cervical, the condition is really then that of an extension of the thorax upward, which is much more interesting than the existence of a rudimentary pair of cervical or other ribs. Sir William Turner, who on his last visit to the United States examined the skeleton, particularly the ribs, expressed the opinion that we have here a pair of cervical ribs articulating with the seventh cervical vertebra, and that all the thoracic

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<sup>1</sup> This index is in the male European 112; in the female European, 116; in the Negro, 106; in the Australian, 99; in the Andamanese, 94; in the Orang, 87; in the Gorilla, 72. Sir William Turner: *Journal of Anatomy and Physiology*, XX, and *Challenger Reports, Zoölogy*, XVI.

structures, the blood-vessels included, were elevated, the extra cervical ribs assuming the anatomical relations which ordinarily belong to the first dorsal pair.

The greater number of ribs, however, is not the only peculiarity in the case. Examination of the ribs of the left side shows the first and second ribs partly blended together. The spinal articular parts of both ribs are normal, though much closer together than they would be ordinarily; and the bones continue independent for about 2 cm., at which point they gradually blend and form one rib. This shows no further marks of union, and is much broader and stronger than the first rib of the right side, which has a large single articular surface on the sternum, situated lower than the corresponding one of the other side. The third ribs are normal, and equal on both sides; and none of the remaining pairs show any thing unusual. The maximum breadth of the conjoint rib on the left is 2.2 cm.; that of the first right rib, 1.3 cm. (Plate III.)

The anomaly just described is rare in the human species. It has received the name of 'bicipital rib.' It was first described by M. Hunauld,<sup>1</sup> and was given considerable attention by Sir William Turner.<sup>2</sup> The anomaly occurs invariably at the apex of the thorax (Turner), and consists mostly of a union of a cervical rib with the first thoracic.<sup>3</sup> The anatomical peculiarity, according to Sir William Turner,<sup>4</sup> "is not due to a bifurcation of the shaft of a single rib at its vertebral end into two heads, but to the fusion of what ought to have been the shafts of two distinct ribs into a common body." The significance of the anomaly, when due to a union of a cervical with the first thoracic rib, must be about the same as that of a free cervical rib, the causes of which are not yet fully established.

Supernumerary ribs occur both in man and in lower animals, and signify in all probability a recurrence of lower forms. Cuvier found supernumerary ribs in the bison; Turner says the condition is quite common in the Cetaceæ; and I have been told by naturalists of examples of this kind in other mammals. Dr. F. Boas informs me that he found supernumerary ribs and vertebræ

<sup>1</sup> Mémoires de l'Académie Royale de Paris, 1740, p. 525.

<sup>2</sup> Journal of Anatomy and Physiology, IV, November, 1869; V, May, 1871; XVII, April, 1883, pp. 384-400.

<sup>3</sup> R. Knox: London Medical Gazette, November 3 and 10, 1843.

<sup>4</sup> Journal of Anatomy and Physiology, XVII, p. 387.



in quite a high percentage of human skeletons from northwest Vancouver Island,<sup>1</sup> and references to such phenomena are found in medical literature. In the majority of cases, the supernumerary ribs are cervical.<sup>2</sup> Single supernumerary ribs are not so infrequent as the bicipital ribs, though I have lately seen in Professor Dwight's collection in the Anatomical Museum of the Harvard Medical School, Boston, Mass., a specimen of bicipital rib, much like that here described.<sup>3</sup>

The union of two ribs in the manner here observed, in whatever portion of the thorax it may occur, implies a deficient evolution of one of the ribs concerned, and a fusion of the two bones along more or less of their course during the early stages of ossification of the parts. If the supernumerary rib is so deficient, as it is in this case, it shows that its cause, be it a reversion or any thing else, was less complete in this than in other instances where a similar rib is free.

*Measurements of the Normal Ribs.*

Dorsal arc of longest right rib.....	30.3 cm
Antero-posterior diameter between extremities of the bone..	20.5 cm
Greatest height of ventral curve.....	7.5 cm
Dorsal arc of longest left rib.....	30.0 cm
Antero-posterior diameter of longest left rib.....	20.2 cm
Greatest height of ventral curve.....	7.5 cm

The left ribs average about 6 mm. shorter than the corresponding right ones.

STERNUM.

The sternum is 13.4 cm. high, and its maximum width is 5.4 cm. The whole bone is ossified,<sup>4</sup> the original separations being marked by slight bony ridges. The lowest segment is perforated by two large foramina, the upper round, the lower oval. The left border of the sternum appears less developed in its upper third than the right, and is shorter, giving the bone a certain degree of curvature to the left. (Fig. 7.)

<sup>1</sup> These specimens are in the Field Columbian Museum, in Chicago, and have not been described.

<sup>2</sup> For further literature on the subject, see end of the paper.

<sup>3</sup> Since the above was written, I brought from Mexico (State of Jalisco) another bicipital rib; and I also found in Professor Huntington's anatomical collection, at the New York College of Physicians and Surgeons, a rib which represents an ancient fusion of the anterior portions of two bones, and has two articular facets anteriorly. (Plate II, Fig. 2.)

<sup>4</sup> Complete ossification of the sternum, except in very advanced age, is decidedly an exception among the Indians, in whom I generally find the manubrium detached.



Fig. 7.  
Front View of Sternum ( $\frac{200}{222}$ ).

There are 7 articular facets for the ribs on the right side, and 6 on the left; the first facet on the left occupying the place opposite and nearly between the right first and second. This form of the sternum shows that the anomaly of the ribs originated early in the embryonic life of the individual. The blending of the first pair of ribs may be of a later though still fœtal origin, and is less significant.

When reconstructed, the dorsal part of the spinal column of the skeleton shows a moderate lateral curvature, convex to the left, and due no doubt to compensation for the lowering of the left side of the thorax, caused by the joined pair of ribs.

#### UPPER EXTREMITIES.

##### CLAVICLES.

The clavicles present nothing unusual. Their mean length is 12.2 cm., and the bones are rather slender.

##### SCAPULÆ.

The bones are light, and their form approaches that most common in the whites.

Total height (inferior angle to superior angle).....	14.1 cm
Inferior angle to middle of glenoid fossa.....	13.5 cm
Maximum breadth (lower border of glenoid to maximum point on posterior border).....	9.3 cm
Depth of glenoid fossæ.....	0.4 cm
Maximum depth of subscapular fossæ.....	1.8 cm
Maximum point of width on vertebral border to end of acromion.....	12.8 cm
Maximum point of width on vertebral border to inferior angle, .....	10.45 cm
Total scapular index, <sup>1</sup> $\frac{\text{maximum breadth} \times 100}{\text{total height}}$ (Broca).....	65.9

<sup>1</sup> This index is in the European 64.3; in the Bushmen, 66.2; in the Polynesian, 66.6; in the Chinese, 66.7; in the Peruvian, 66.5. Sir William Turner: Challenger Reports, XVI, p. 86.



## LONG BONES OF THE ARM.

These bones are of about medium size, and of normal shape. Both ulnæ are lost.

Length of right humerus.....	30.3 cm
Length of left humerus.....	30.6 cm
Mean antero-posterior diameter at middle.....	1.9 cm
Mean lateral diameter at middle.....	1.4 cm
Bicondyloid diameter.....	4.5 cm
Natural perforation of right olecranon fossa.....	8 x 6 mm
Natural perforation of left olecranon fossa.....	6 x 4.5 mm
Length of each radius (nothing special in aspect).....	24.6 cm
Humero-radial index <sup>1</sup> .....	80.78

Our subject, according to this scale, had his fore-arms, in proportion to his arms, even longer than the Negro, and is surpassed in this respect only by the Andamanese and by the Chimpanzee and the Orang. This index has full value with the subject in question, as all the bones of his upper extremities are entirely normal. But few of the bones of the hand are present. They are rather slender, small in size, and show nothing unusual.

## PELVIS.

The ossa innominata are normal, of medium strength. The whole pelvis is symmetrical, but unusually small.

Maximum height of ossa innominata.....	18.7 cm
Maximum breadth of ossa innominata.....	13.1 cm
Maximum lateral diameter of pelvis (between external iliac crests).....	25.5 cm
Pelvic index <sup>2</sup> .....	136.3

Multiplying the width of the pelvis by 100, and dividing the product by the height of the ossa innominata, gives the pelvic index. As seen by the table above, this index in the specimen in question is exceeded by that of a European woman only. The proportion of pelvic breadth to pelvic height has no bearing on the spaciousness of the basin, which, as seen from the absolute values, is below the medium. The distance from the anterior and superior

<sup>1</sup> This index is in the Eskimo 71; in the European, 74; in the Australian, 77; in the Negro, 79; in the Andamanese, 81; in the Gorilla, 80; in the Chimpanzee, 90; in the Orang, 100. Quain: *Anatomy, Osteology*, p. 99. London, 1893.

<sup>2</sup> This index in a European woman reached 136.9. In 46 male Europeans, it averaged 126.6; in 17 male African Negroes, 121.3; in 20 anthropoids, 105.6. Topinard: *Elements d'Anthropologie*, p. 1049.

part of the pubis to the tip of the first sacral spinous process is in this case 15.6 cm.

Internally : superior strait

Antero-posterior diameter.....	9.0 cm
Maximum lateral diameter.....	11.5 cm
Index of superior strait (showing a high standard).....	78.2
Oblique diameter of superior strait.....	11.4 cm
Tip of sacrum to inferior lip of pubis.....	10.4 cm
Greatest interior separation of tubera ischii.....	9.0 cm
Diameter between ischiatic spines.....	7.6 cm
Subpubic angle, measured by projection.....	about 58°
Obturator foramen, medium size, obliquely triangular.	

LOWER EXTREMITIES.

The bones of the lower extremities of this skeleton are inferior in strength to similar bones of an average white person. The long bones of the two limbs differ somewhat in length, the right femur and left tibia and fibula each being about 4 mm. longer than the same bones of the opposite side.

FEMORA.

The shape of the thigh-bones is rather peculiar. The neck is somewhat longer than in the average white. Below the smaller trochanter, the shaft is flattened (platymeric) antero-posteriorly. This flattening is not an anomaly, but a special ethnical characteristic, which I have found in many places in Mexico and elsewhere on this continent. (Fig. 8.) Below the upper third, the shaft of the femur becomes almost circular, and shows a moderate curvature forward.<sup>1</sup> The linea aspera

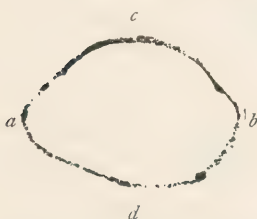


Fig. 8. Horizontal Section of the Right Femur 2 cm. below the Smaller Trochanter: *a*, Internal Border; *b*, External Border; *c*, Anterior Surface; *d*, Posterior Surface.

is not very pronounced. The condyles are normal.

Antero-posterior diameter of shaft 3.5 cm. below minor trochanter.....	2.0 cm
Lateral diameter of shaft 3.5 cm. below minor trochanter..	2.9 cm
Average length of femur.....	40.9 cm

<sup>1</sup> The curvature of American femora often exceeds that of the femora of whites, and equals that of the Negro.

Maximum length of right femur.....	41.1	cm
Maximum length of left femur.....	40.7	cm
Antero-posterior diameter at centre.....	2.3	cm
Lateral diameter at centre.....	2.25	cm
Maximum breadth of condyles.....	6.7	cm
Maximum antero-posterior diameter of condyles.....	5.6	cm
Angle of neck.....	130°	

TABLE.

These bones present at least two interesting characteristics: they are to a certain degree platycnemic; and their heads, and the planes of the articular surfaces of the knees, are much more inclined backward than is usual. The shape of the tibiæ, in transverse section at or above the middle, is quadrangular. The platycnemic condition of the tibiæ is not especially significant. We find this characteristic distributed over immense areas of this continent, and in types of people differing physically to a considerable extent. Flat tibiæ abound in Mexico, in our own southwest among the pueblos and the cliff-dwellers, in the great Mississippi basin among the mound-builders, as well as farther east to Florida, and farther west and north to British Columbia. I have measured flattened tibiæ from Peru and Bolivia; and as the range of anthropological material increases, this characteristic, rare in white races, is found common to vast regions, and apparently over both Americas.

The backward inclination of the heads of the tibiæ in this skeleton is a very marked characteristic, one much less frequent than the flattening of tibiæ, and equally as interesting. I present two drawings of the upper part of one of the bones in question. These drawings demonstrate the inclination of the heads and the articular surfaces to the axis of the shaft. The inclinations are considerable, and involve the facets. (Figs. 9, 10.)

The significance of this structural peculiarity is not clear. It is not certain that such an inclination of the head, and even of the articular facets, would necessarily affect the straightness of the limbs, and cause an inclination of the knees forward; for a little overgrowth of the posterior parts of the femoral condyles could easily produce the proper compensation for such an inclination. Such compensation would be detected only with considerable difficulty, due to the form of the femoral condyles, and I



am not positive whether it exists in this case. When the femur and tibia of one side are applied together, they can be adjusted in a straight line, without showing any unnatural position of the articular surfaces.

Inclination of the head and of the articular facets of the tibia may be influenced by an habitual squatting position. Lighter grades of inclinations of the head of the tibia to the shaft are

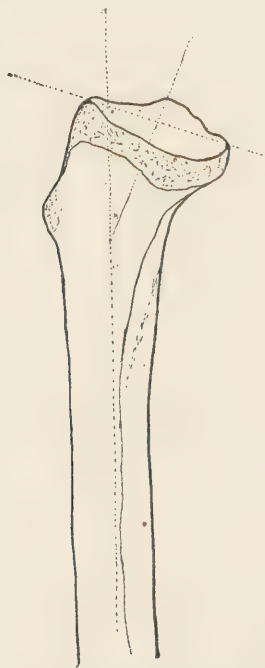


Fig. 9. Inner Side of Tibia ( $\frac{88}{252}$ ).



Fig. 10. Outer Side of Tibia ( $\frac{88}{252}$ ).

occasionally seen in all peoples; but so high a degree as the tibiae of this skeleton present is very rare, and especially so in the white race. I have seen similar inclinations of the facets, and especially of the head of the tibia, in Apes, particularly in the two adult Gorillas preserved in Professor Huntington's Anatomical Museum in the New York College of Physicians and Surgeons. The meaning and import of this structural peculiarity, I believe, cannot be definitely solved at present, but must be relegated to

further specific studies. It is less rare in Americans than in many other races of people. I have seen several grades of it in tibiæ from different parts of this continent, in one belonging to the ancient Utah people; for instance; and I found it quite common among our Mexican tribe, the Huicholes (Jalisco).<sup>1</sup>

Average length of tibiæ.....	35.45 cm
Length of right tibia .....	35.3 cm
Length of left tibia .....	35.6 cm
Mean antero-posterior diameter at middle.....	2.8 cm
Mean antero-posterior diameter at nutritive foramen.....	2.95 cm
Mean lateral diameter at middle (the right bone is slightly thicker).....	1.65 cm
Mean lateral diameter at nutritive foramen.....	2.0 cm
Index <sup>2</sup> at middle .....	58.9
Platycnemic index at nutritive foramen <sup>3</sup> .....	67.8
Femoro-tibial index of this skeleton <sup>4</sup> .....	86.7

Thus it is seen that our subject is as remarkable for the great length of his tibiæ compared to his femora, as for similar relations of the bones of his fore-arms and arms.

#### FIBULÆ.

Their form is similar to that of whites.

Length of right fibula.....	34.4 cm
Length of left fibula.....	34.8 cm
Proportion of lower limb (femur + tibia) to upper (humerus + radius) as.....	138.7 to 100.0

#### RIGHT PATELLA.

Maximum height.....	4.4 cm
Maximum breadth.....	4.6 cm
Maximum thickness.....	2.15 cm

<sup>1</sup> See on this subject Collignon, *Rev. d'Anthrop.*, 1880, v. IX; A. Thomson, *J. of Ana. & Phys.*, London, XXIII, p. 616; Fraipont, *Arch. de Biol.*, Gand, 1887, VII, f. III; also *Rev. d'Anthrop.*, 3me série, t. III, p. 145.

<sup>2</sup> This index averages 71.1 in the white male, and 71.9 in the white female.

<sup>3</sup> This index was in 48 African Negroes (Topinard) 71.0. In Americans (Jeffries Wyman, Washington Matthews, and others), it ranges from 40 to 70; and I found it to be in a male adult Gorilla, 61.8; in a female adult Gorilla, 65.6; in an adult Orang, 73.9; in a young Orang, 82.7.

<sup>4</sup> This index in 22 tall European males was 81.1; in 22 short European males, 79.7; in 5 Chinese males, 80.2; in an Eskimo, 78.7; in 5 Polynesians, 82.2; in 3 Australians, 82.1; in 4 Blacks of India, 82.8; in 32 African Negroes, 82.9; in 8 New Caledonians, 83.1; in 2 Tasmanians, 83.6; in 5 male South Americans, 84.1. This index is somewhat higher in the female of most races. In 2 female Bushmen it was 85.8; in a female Arab, 86.3; in a female Negrito, 89.0; in 6 female South Americans, 83.1. Topinard: *Elements d'Anthropologie*, p. 1045.

## RIGHT CALCANEUM.

Maximum length.....	7.4 cm
Breadth of body (in middle).....	3.3 cm
Height of body “ “ .....	4.5 cm

The small bones of the foot present nothing special.

In conclusion, then, the skeleton just described possesses the following principal points of interest: a pair of supernumerary ribs with all the characteristics of regular ribs; very high relative lengths of the bones of the fore-arm and of the leg, and of the sacrum; and the peculiar lower jaw. As secondary points of interest, may be enumerated the small cranial capacity, the blending of the first left pair of ribs with consequent deformity of the spinal column and of the sternum, the pterygospinous foramen (ossification of pterygospinous ligament), the sternal foramina, the perforation of the olecranon fossæ of the humeri, the six segments of the sacrum, the platymery of the femur, a certain degree of platycnemia, and marked inclination backward of the head and of the articular facets of the tibiæ.

In measurements, the skull is highly brachycephalic with but comparatively moderate compression of the occiput: uncompressed, the head could not possibly have been dolichocephalic. The face is mesosème, or of medium breadth in relation to its height. The orbits are high, or megasème. The nasal aperture is lower and broader than in the whites, and platyrrhinic. The posterior nares are of lesser height than breadth. The angle of the lower jaw is low. There is more prognathism in appearance than is shown by measure; it is confined to the upper alveolar process. The humeri show no unusual torsion. The femoral angle is within the limits of the ordinary. The proportion of lower to upper limbs is as 138.7 to 100. The pelvis is rounder than in the European, but considerably smaller. The feet and hands were slender. The subject was right-handed, or, more properly, right-sided, as is indicated by the greater strength of the bones of the extremities on the right side.

So much for the more interesting anatomical characteristics of this skeleton. The next question is, What is the anthropological significance of all the peculiarities observed in this one body? It is clear that a skeleton devoid of pathological abnormalities—which is fully adult and not too aged, and which presents such



characteristics as this shows—is an exceptional, if not unique occurrence. If the skeleton represents a race of people, it is of the highest importance to know more about this race and its place in the rise of mankind. It is safe to say that this is the skeleton of a being zoölogically on a lower scale than is the average white man of to-day, and much inferior even to the known old or present inhabitants of the Valley and State of Mexico. Many of the characteristics of this adobe skeleton approach those of the skeletons of the anthropoids.

The Museum has in its possession but few whole skeletons from the same locality; and none of these show any marked abnormality. On the other hand, only a few of the peculiarities observed in this specimen are such as usually occur otherwise than racially in a normal individual. It seems, however, that, having but one skeleton to consider, the question of individual or racial character of the abnormalities must remain an open one, pending further investigations on additional material from the same locality.

To which of the Mexican ethnic groups do this skeleton and the skulls from the same region belong? For a satisfactory answer there is requisite somatological knowledge of the various groups of the inhabitants of that old and ethnologically highly important region, the Valley of Mexico, as well as a precise knowledge of the geological and archæological conditions of the adobe deposits with their various layers. Of this fact we are certain, that from prehistoric time there have dwelt in the Valley of Mexico a number of more or less distinct peoples, and that most of the people who have been settled in that valley within the last twelve or fifteen hundred years belonged to a stock collectively termed 'Nahuatl.' The very last of the Nahuatl branches who gained supremacy in the valley were the Aztecs, whose progeny occupy to-day some of the regions around the City of Mexico. There can be no doubt that the skeleton described is ancient. Does it belong to the Aztec people, or does it date still farther back,—to some of the Aztec predecessors?

Little is known anatomically about the Aztecs. What we do know is mainly due to Hamy and Quatrefage of Paris. Sergi examined a number of Aztec skulls; and I had occasion to examine some, among which was that of a normal adult male, whose

ancestors were known. The characteristics of Sergi's and my own specimens accord in the main with the observations of Hamy. The main features of these presumably Aztec skulls are, that not one of them has been found artificially deformed in any way, and that they are regularly dolichocephalic. In both these characteristics, this skull, with a number of its companions, differs from Aztec skulls. A number of the male specimens are deformed; and their lowest indices, even in the totally undeformed crania, are but mesocephalic. These crania have belonged to some much shorter-headed people than were the Aztecs, possibly to a different race of people. This race lived contemporaneously with, or but little anterior to, this last branch of the Nahuatl family, for the short skulls are found together with the long ones.

Previous to the Aztecs, the Valley of Mexico is said to have been occupied by the so-called Chichimecs, of whom ethnically and physically we know little. Still earlier the region was peopled by the so-called Toltec nation. Of the pre-Toltec inhabitants of the valley, every thing is uncertain.

The Toltecs have left great monuments, and no doubt also a large number of osseous remains, for which, as yet, no systematic search has been made. Our knowledge of them is due either to archæological excavation or to accident. What material has been secured is seldom properly identified, and is so scattered as to be inaccessible to a single student. Nevertheless, the references in anthropological literature to the skulls of these people all agree in the main particulars. The most extensive of these references is to be found in Morton's '*Crania Americana*.' Morton, it is well known, attributed to the Toltecan people a great extent and high importance. Another mention of Toltec skulls is to be found in Quatrefage and Hamy's '*Crania Ethnica*;' and still another, though not direct, is in the '*Catalog de la Collection de Anthropologia del Museo Nacional*,' por Alfonzo L. Herrera y Ricardo E. Cicero.

In all the above descriptions the Toltecan skulls are represented as more or less brachycephalic, and often deformed. These are likewise the prominent characteristics of one portion of the St. Simon skulls, including the cranium of the skeleton described. The six more or less deformed male skulls of the collection show cephalic indices of from 86.0 to 93.4; three male

undeformed skulls reach indices of from 77.4 to 81.7; and the average cephalic index of the five undeformed female skulls is 81.4. The illustrations which Morton gives of his Toltecs agree also with the shape and general aspects of some of the skulls from St. Simon. For comparison three views of male skulls from this place are given in Plates IV and V, the middle one being that of the above-described skeleton.

Morton and Meigs considered as Toltecs all American aborigines who attained a certain degree of civilization, and included within this group the mound-builders, the cliff-dwellers, and others. Outside of Toltecs there was only one more group of Americans, and those were the Barbarians, which included most of the North and South American Indians. Since Morton and Meigs, however, the term 'Toltec' has become gradually restricted; most historians and most recent authors understand by it the people who occupied the Valley of Mexico before the Chichimecs, Acolhuas, and Aztecs,—people who may also have belonged to the Nahuatl stock, and who disappeared before the later Nahuatl invasions, leaving behind them signs of high culture, and possibly a part of this culture itself.

Under these conditions it would be very difficult to define the proper ethnic nature of the specimen. I cannot term it the skeleton of a Toltec, so long as the vagueness of this term continues. The possibility that it is Aztec cannot be excluded, but then it would be greatly exceptional. Nothing more definite can be established until the Mexican Valley adobe deposits have been thoroughly explored and studied, and until we possess large collections of 'Toltec' and adobe skulls and skeletons.

However, the uncertainty as to the particular race to which the subject belonged is really of secondary importance, and, it is hoped, will not detract from the interest of the features of the skeleton which have been made the subject of this paper. In conclusion I may remark that human osseous remains from various parts of Mexico are prolific in interest, and particularly in zoologically inferior characters, and that they deserve pre-eminently the thorough attention of anthropologists.



## FURTHER LITERATURE ON BICIPITAL, CERVICAL, AND SUPERNUMERARY RIBS.

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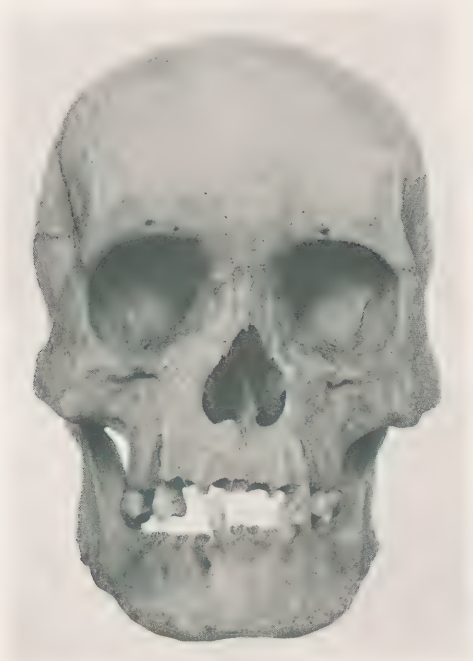
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FRONT AND SIDE VIEWS OF SKULL, NO.  $\frac{99}{252}$ .





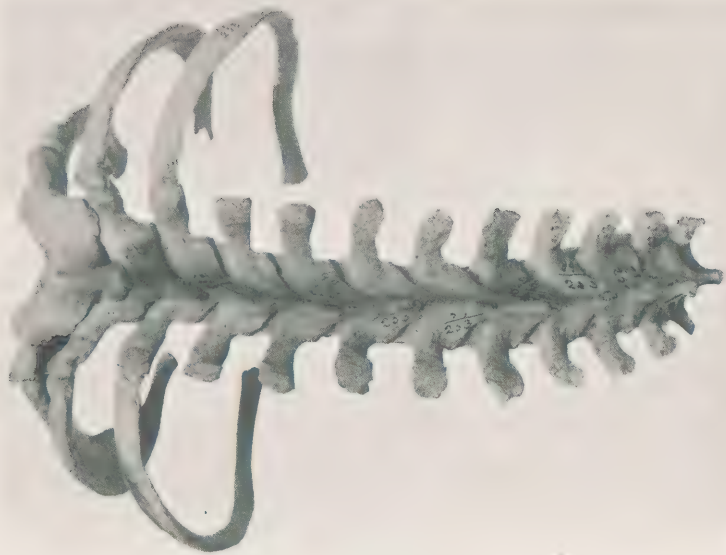
Fig. 1. Lateral View of Lower Jaw, No.  $\frac{99}{252}$ .



Fig. 2. *a*, Bicipital Rib (fragmentary) from an Ancient Burial-Place in the State of Jalisco, Mexico; *b*, Broad Rib with two Facets, formed by Union of First and Second Ribs; Provenience Unknown. (Anat. Coll., Coll. Phys. and Surg.)







VENTRAL AND DORSAL VIEWS OF RIBS AND SPINAL COLUMN, No. 2288.







LATERAL VIEW OF THREE BRACHYCEPHALIC SKULLS FROM THE ADOBE DEPOSITS OF ST. SIMON, VALLEY OF MEXICO.





FRONT VIEW OF THREE BRACHYCEPHALIC SKULLS FROM THE ADOBE DEPOSITS OF ST. SIMON, VALLEY OF MEXICO.









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